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(51) INT CL<sup>7</sup>

**A61L 9/03**

(52) UK CL (Edition R )

**A5G GV**

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|                      |                       |                      |
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| <b>WO 97/37693 A</b> | <b>AU 002144283 A</b> | <b>US 5115975 A</b>  |
| <b>US 4695434 A</b>  | <b>US 4629604 A</b>   | <b>US 4603030 A</b>  |

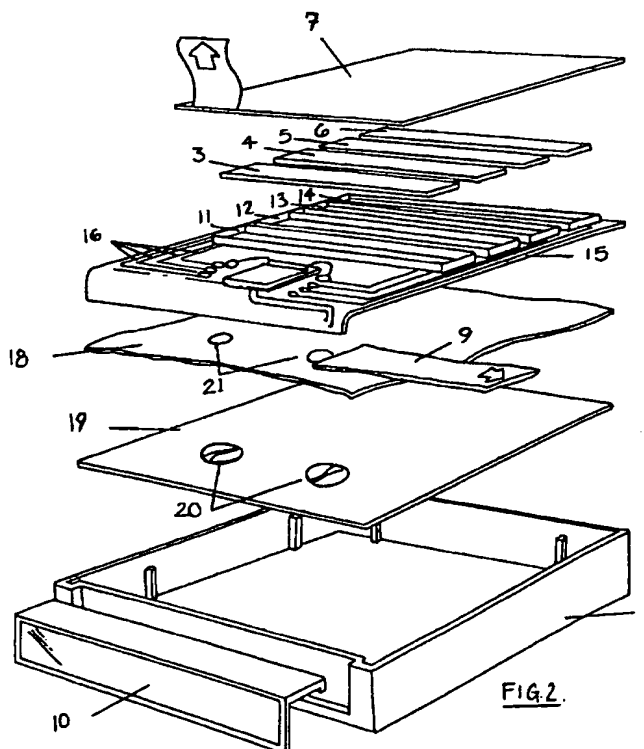
(58) Field of Search

**UK CL (Edition R ) A5G GV**  
**INT CL<sup>7</sup> A61L 9/03**  
**On-line : WPI, EPODOC, JAPIO**

(54) Abstract Title

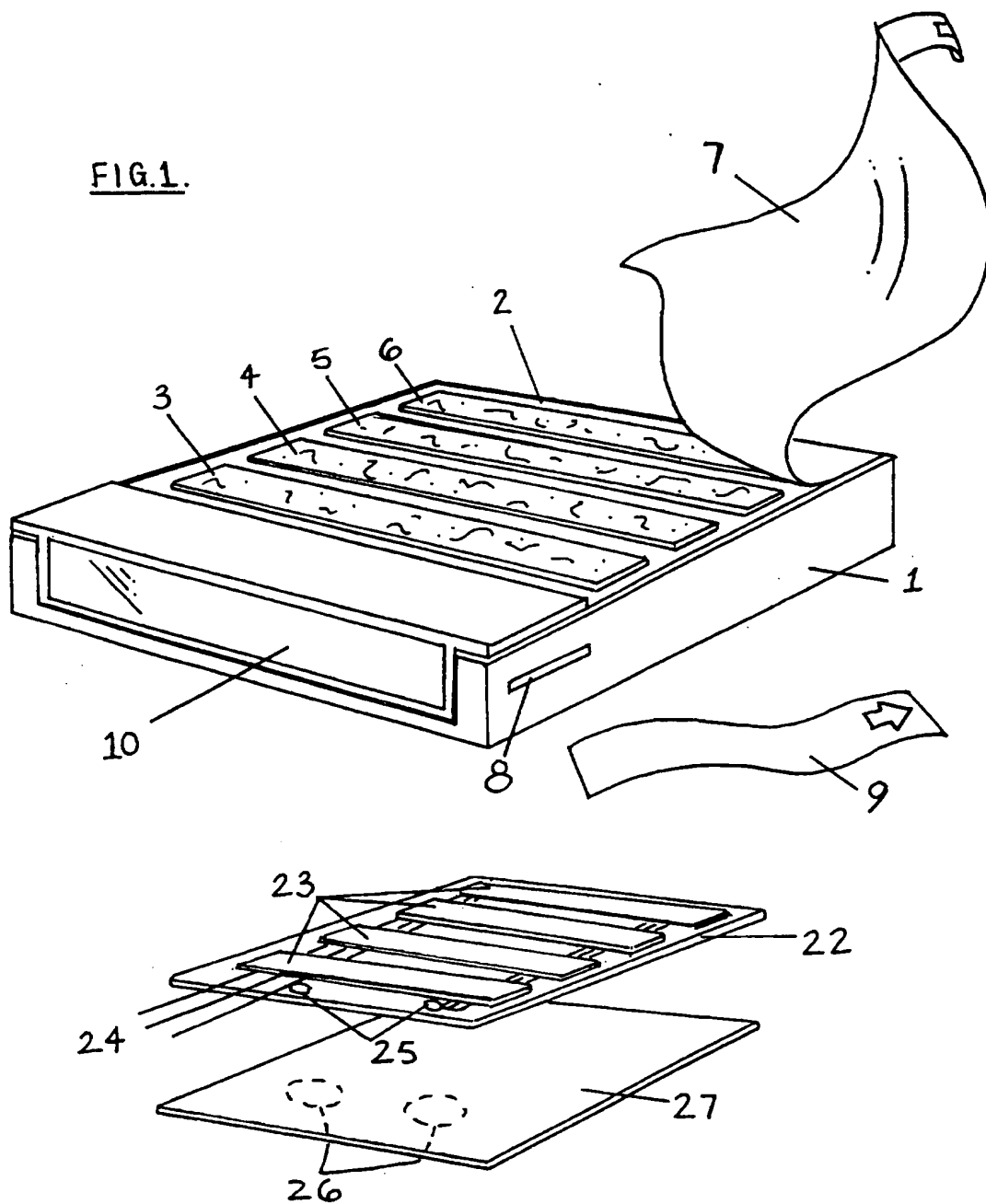
**Air freshener**

(57) An air freshener for dispensing a plurality of fragrances into the surrounding atmosphere comprises a casing 1, a timing circuit 15 including an electronically programmable chip, a heating device 16 controlled by the chip and a replaceable cartridge (2, see Fig. 1) having a plurality of fragrance carriers 3, 4, 5, 6, at least one of which is selectively heatable by the heating device 16 to emit a controlled sequence of fragrances into the surrounding atmosphere. The device prevents habituation to the fragrances emitted.



**FIG. 2.**

FIG.1.



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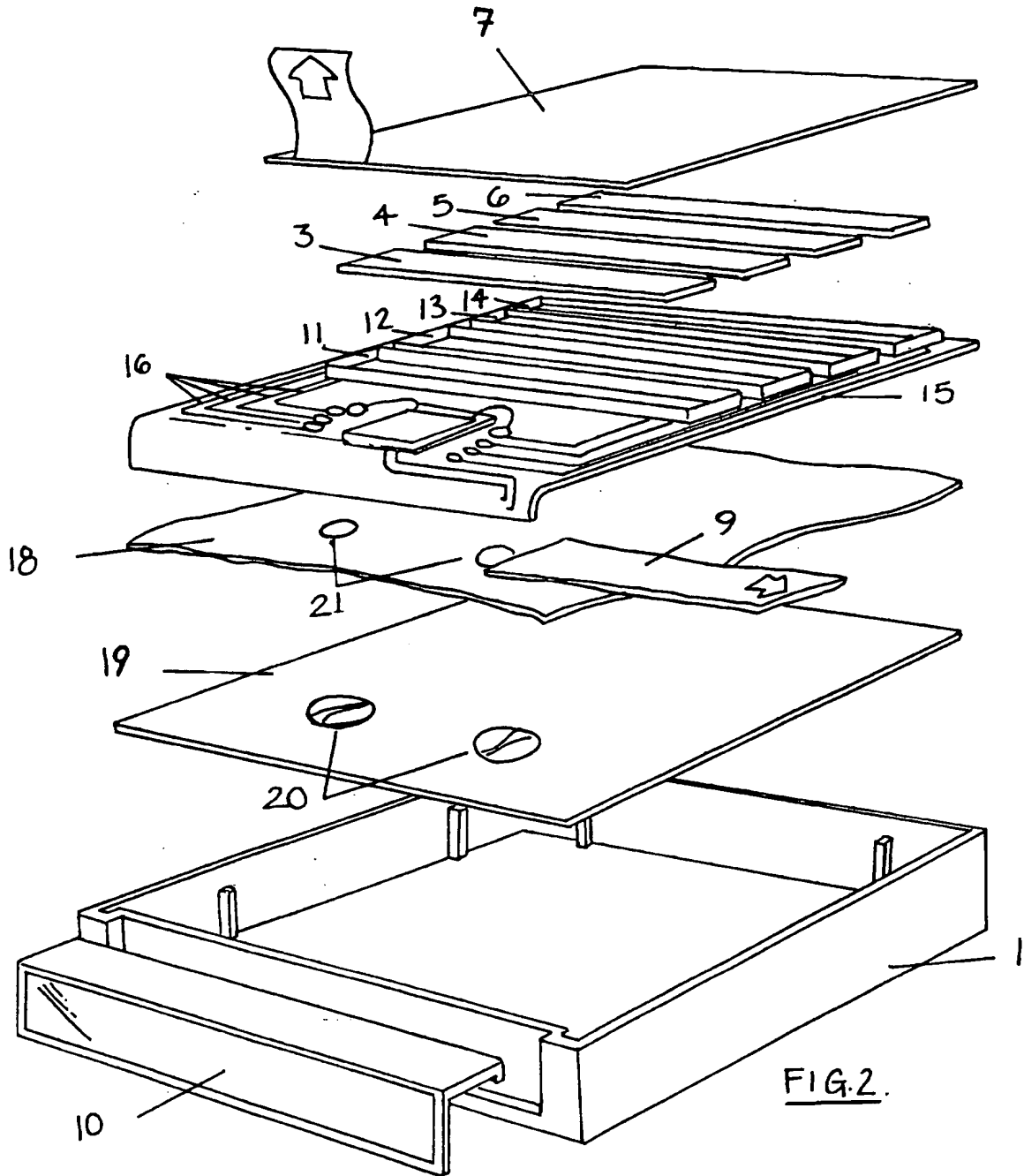


FIG.2.

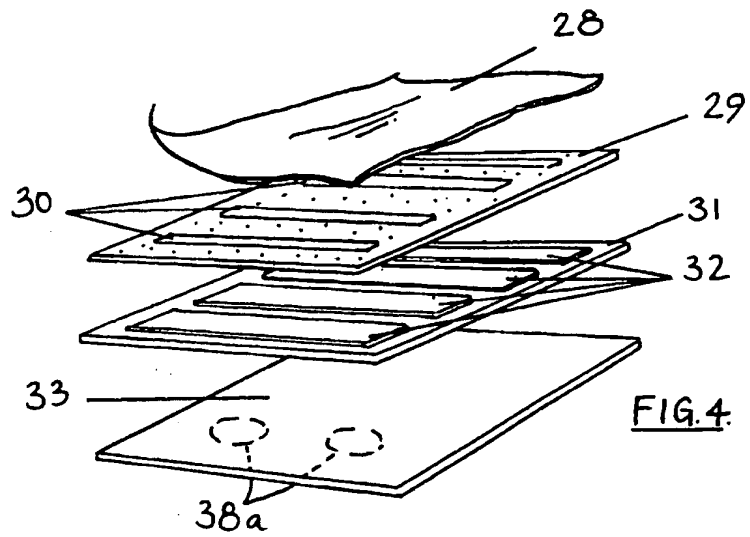


FIG. 5.

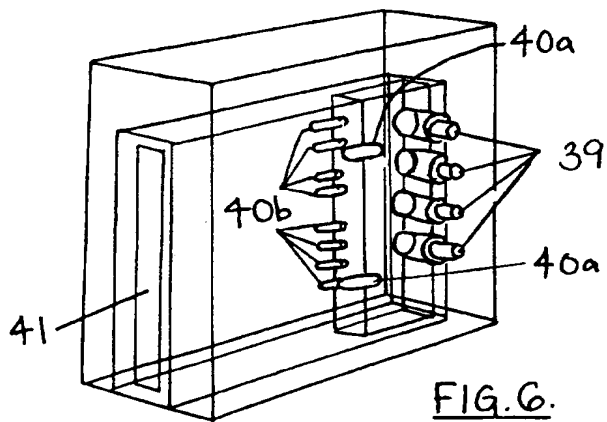
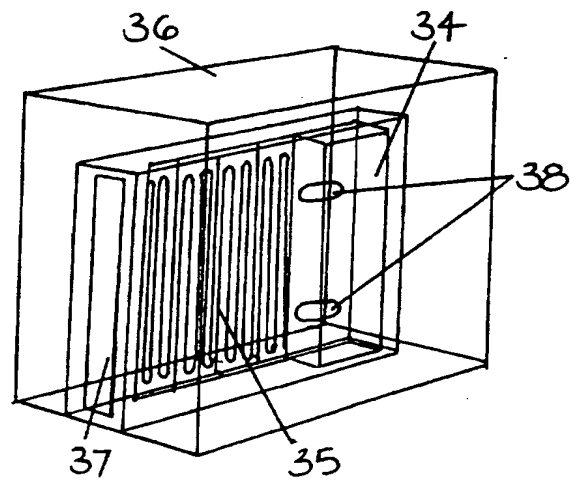


FIG. 6.

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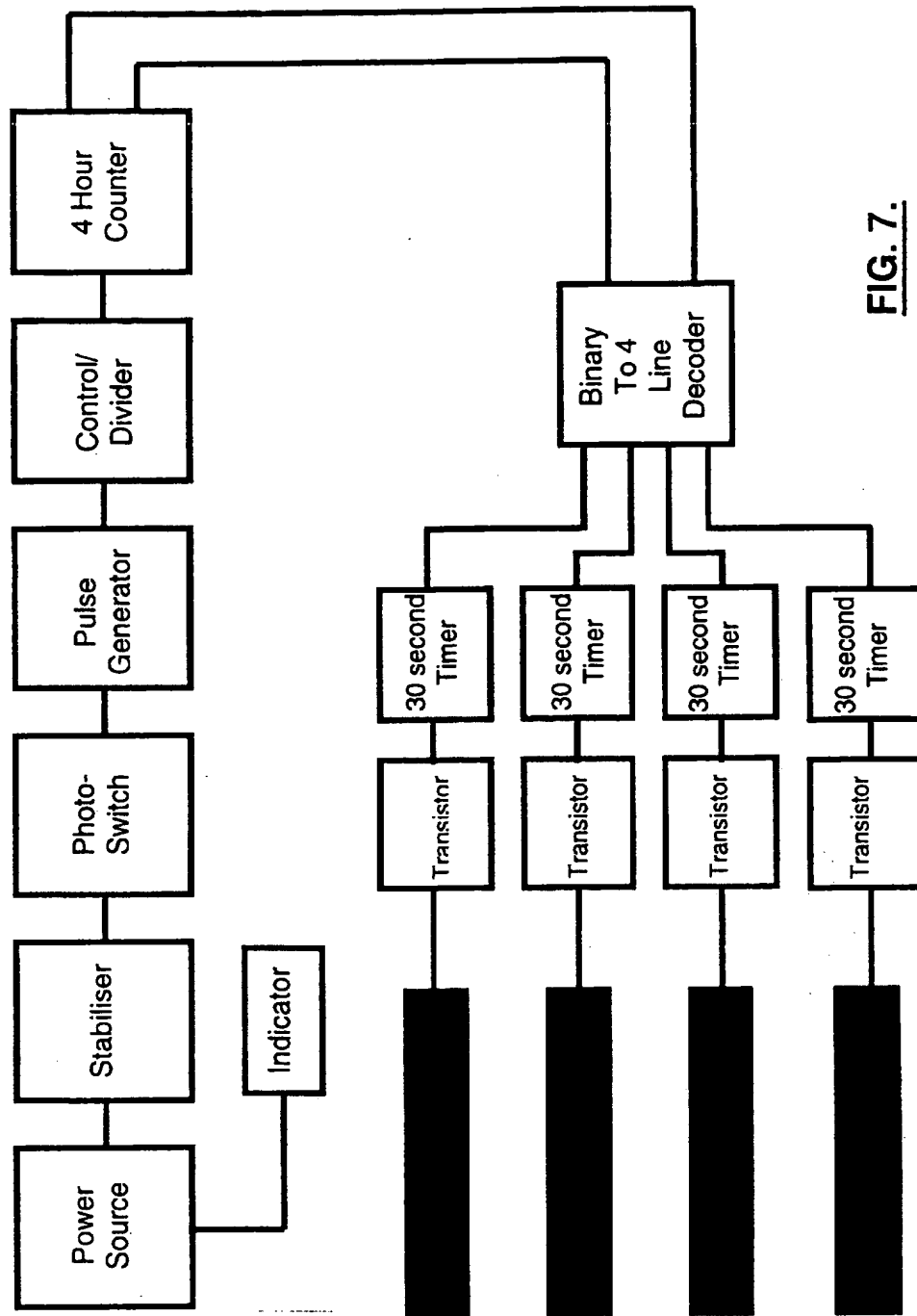


FIG. 7.

42

44

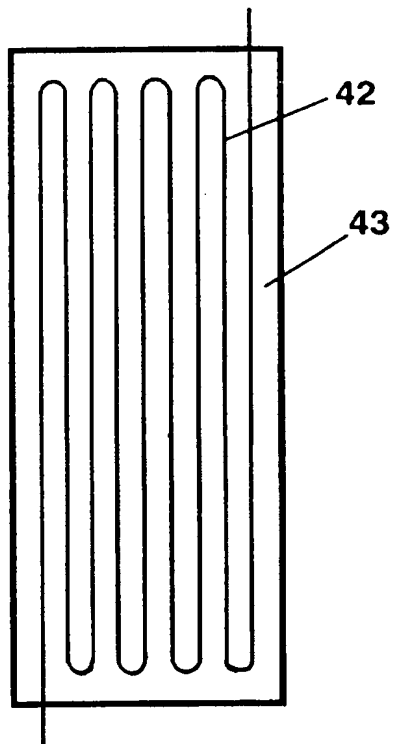


FIG. 8.

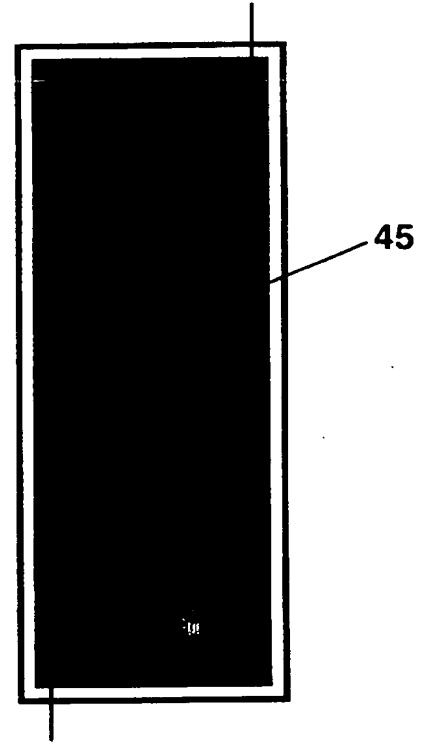


FIG. 10.

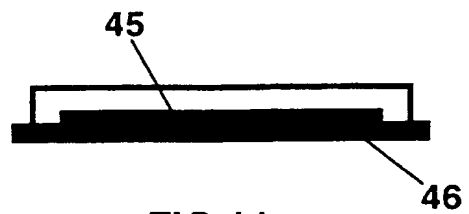
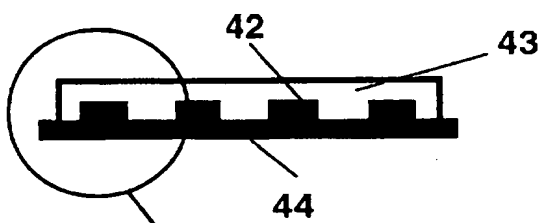


FIG. 11.

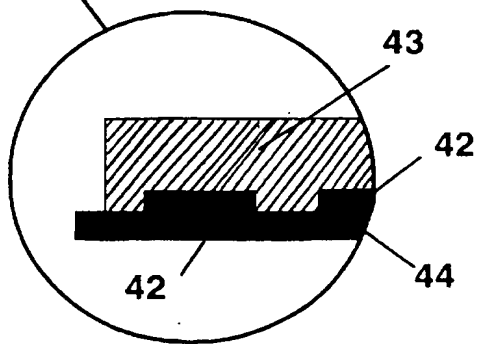


FIG. 9.

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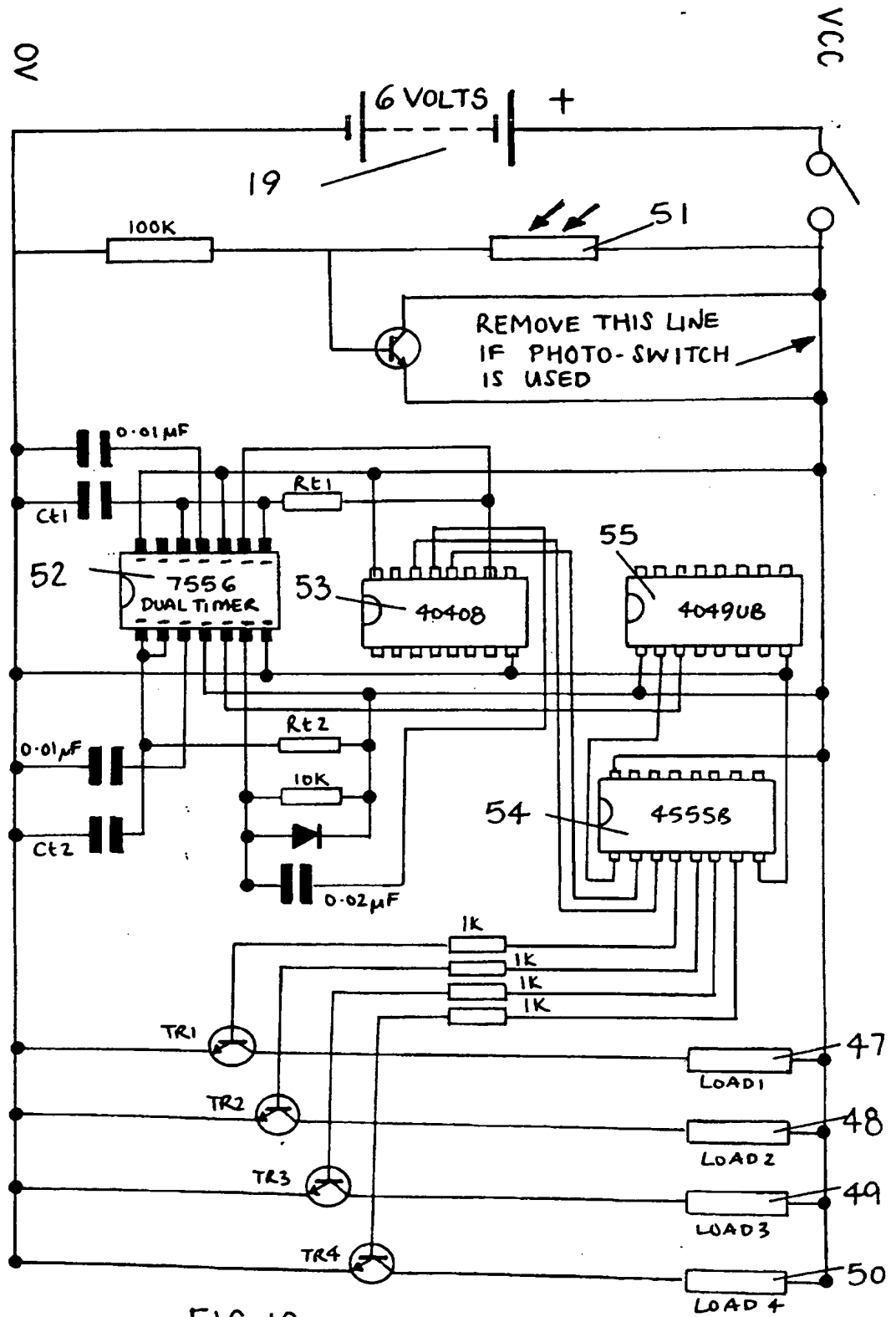


FIG. 12.

**AIR FRESHENER**

This invention relates to an air freshener.

The sense of smell is the most sensitive sense possessed by humans. However,  
5 no matter how strong the fragrance experienced is, after a period of 3 to 4 hours, the recipient loses the ability to recognise the smell.

Existing air fresheners rely on either increasing the intensity to increase the fragrance or increasing the temperature to free more concentrated fragrance into the  
10 atmosphere. Both of these solutions suffer from the same problem, i.e. to increase the strength of the fragrance, more fragrance is added to create a longer lasting effect but this becomes monotonous and is overpowering to the recipient.

The present invention seeks to provide an air freshener which can avoid the  
15 monotony and sameness caused by most air fresheners available at present and seeks to replace a single fragrance in the atmosphere by a refreshed fragrance over a period of time.

The invention also seeks to provide an air freshener with a replaceable cartridge  
20 having a plurality of fragrances all of which are to be dispensed automatically and one or more are to be selectively dispensed.

According to the invention, an air freshener for dispensing a plurality of fragrances into the surrounding atmosphere comprises a casing, a timing circuit including  
25 an electronically programmable chip, a heating device controlled by the chip and a replaceable cartridge having a plurality of fragrance carriers selectively heatable by the heating device under the control of the chip to emit a controlled sequence of fragrances into the surrounding atmosphere.



The plurality of fragrances preferably comprise at least two fragrances of a complementary nature and these complementary fragrances may be different tones of the same fragrance.

5           At least three fragrances may be provided, and may comprise a main fragrance and two subsidiary fragrances. The main fragrance may be permanently dispensed while the two subsidiary fragrances may be energised at intervals in sequence.

10           The heating elements of the heating device may be contained in the replaceable cartridge and the power for the air freshener may be provided by a battery or from the mains. In the case of a battery, this may be contained in the cartridge.

15           A visible indicator may be provided in the casing for indicating the current life status of the fragrance and/or battery (if provided) and/or the cartridge as a whole. The timing circuit may have an opto-switch which can sense ambient light conditions and which can switch the air freshener on or off in dependence thereon.

20           A microprocessor may be associated with the timing circuit to enable programming of the air freshener by the user.

25           The heating device may comprise an electric resistance foil located in the fragrance carrier, resistance wires whether or not on a ceramic base, or an etched or printed resistance circuit controlled by a printed circuit board, the resistance circuit passing through individual fragrance carriers.

The invention will now be described in greater detail, by way of example, with reference to the drawings, in which:-

30           Figure 1 is a perspective view of an air freshener cartridge according to an embodiment of the invention;

Figure 2 is an exploded perspective view of the air freshener cartridge shown in figure 1;

Figure 3 is a perspective view of a first embodiment of a consumable fragrance  
5 insert with a heater element;

Figure 4 is a perspective view of a second embodiment of a consumable  
fragrance insert with a heater element;

10 Figure 5 is a perspective view of a housing with a processing circuit and heater  
element;

Figure 6 is a perspective view of a housing with a processing unit;

15 Figure 7 is a system block diagram of an electronic circuit;

Figure 8 is a diagram of a first embodiment of a heater element;

20 Figure 9 is a cross-section of the heater element shown in figure 8 with an  
enlarged view of a portion of the heater element;

Figure 10 is a diagram of a second embodiment of a heater element;

25 Figure 11 is an enlarged cross-section of the heater element shown in figure 10,  
and;

Figure 12 is a circuit diagram of a timing circuit for timing the power supply to  
the heaters.

30 Relating firstly to figures 1 to 3, an air freshener in accordance with one  
embodiment of the invention comprises a housing 1, suitably of a rigid plastics material,

for receiving a fragrance cartridge 2 having, for example, four fragrances 3, 4, 5 and 6. The cartridge case 1 and fragrance cartridge 2 may be used as a self contained unit but more usually will be inserted into a housing (not shown) having suitable apertures for emission of the fragrances.

5

These fragrances 3 to 6 may be different fragrances but, as will be explained hereafter, they will preferably be different "tones" of a single fragrance. Where the air freshener is battery operated, the battery will suitably form a part of the cartridge although it will be equally well understood that the air freshener may be mains operated, in which case, the housing will be provided with means (not shown) for connecting the air freshener to the mains.

The fragrance cartridge as shown, is a self contained cartridge with a peel-off cover 7 for exposing the four fragrance strips to the surrounding atmosphere. As shown, a slot 8 is provided in the side of the housing 1 from which an activation tab 9 is removed to power up the battery. As an alternative, the housing may be so arranged that activation of the battery is achieved merely by pushing the cartridge case 1 into a suitable housing.

As can be seen more clearly from figure 2, the fragrance strips 3 to 6 are located in four recesses 11 to 14 provided on a printed circuit board 15 which carries heating elements 16. The battery 19 which is suitably a flat battery such as those sold under the Registered Trade Mark POLAROID POLAPULSE, is located adjacent to the circuit board 15 with the intervention of a thermal barrier sheet 18. The POLAROID POLAPULSE<sup>®</sup> battery is a replacement 6 volt cell having a shelf life of seven years and providing an output of 150 milli-amps per hour.

On removal of the actuation tab 9, contacts 20, which then pass through apertures 21 in the thermal barrier sheet 18, engage with appropriate contact points on the printed circuit board 15 to energise the heater elements.

30

Figure 3 illustrates one embodiment of a disposable heater element comprising a substrate 22 having four fragrance carriers 23 in engagement with heater element 24 and controls 26 on the reverse side to make contact with the contacts 40(a) in Figure 5.

5           A second embodiment of disposable heater element is shown in figure 4 in which a peel-off fragrance barrier 28 is secured to a perforated aluminium foil 29 with a series of three slots 30 to minimise heat transfer from one fragrance to the next. A substrate 31 carries four strips of different or tonally different fragrances 32, the various layers of the shown construction being laid on the flat battery 33, having controls 38(a).

10

The heater elements can be located in a processing circuit and heater element as shown in figure 5. The consumable fragrance cartridge and battery are inserted in a slot 37 so that the battery contacts 38(a) engage contacts 38 of the processing circuit and heater elements.

15

A third embodiment of a cartridge for a processing circuit shown in figure 6 has optional user interface controls 39 to boost the liberated fragrance from 25 in accordance with the size of the room in which the cartridge is placed. The heater and processing circuit has spring contacts 40(a) to engage the battery fragrance cartridge so that  
20           activation of the cartridge is automatic on insertion of the cartridge in the enclosed slot 41 and contacts 40(b) make contact with heater element 24 in figure 3.

Figure 7 shows a block system diagram for use with the air freshener circuit. The various boxes of the diagram are labeled with the components for a four fragrance  
25           circuit indicated by boxes labeled LOADS 1 to 4.

The mains power source reduces the voltage to 6 volts DC by way of a transformer. The battery comprises primary cells having a nominal terminal voltage of 6 volts. The stabiliser regulates the voltage within close limits to ensure the robust  
30           performance of the control and timing operations.

The photo-switch is intended to control the circuit so that it will operate only when the air freshener is situated in an area lit either by daylight or artificial light. The photo-switch comprises a photo-sensitive element controlling a switching device. It will only switch on when a threshold level of illumination is present.

5

The pulse generator comprises a timing circuit arranged to produce a square wave output upon which the digital circuitry operates.

10 The Counter/Divider consists of a series of counters which count down the relatively fast timing pulse to produce the desired output pulse. The 4-hour Counter produces a binary output which counts 0 to 3 at four hour intervals in binary code before resetting and repeating the count.

15 The Binary to 4 line decoder converts the incoming binary count to provide output signals of approximately four hours duration on each of the four output lines in sequence. The 30 second timers are monostable timers arranged to give an output signal for 30 seconds after being triggered.

20 The transistors are arranged to switch current to the heating elements. They will switch on only for the duration of the control signal received from the 30 second timers.

The heating elements labelled LOAD 1 to LOAD 4 are resistance elements produced either by wire, printing or etching which provide the rise in temperature required for liberation of the fragrances.

25

The indicator is a visual indicator giving a representation of the state of discharge of the battery or if mains the life status of the fragrances.

30 The heater elements may take various forms, two of which are illustrated in figures 8 and 9 and figures 10 and 11 respectively.

The heating element shown in figure 8 is a sinusoidal wire heater element 42 embedded in a substrate 43. The enlarged drawing of the cross section through the substrate and element shows that the heater is in intimate contact with the fragrance gel 44.

5

In the second embodiment of the heater shown in figures 10 and 11, the heater is a printed conductor 45 in intimate contact with the fragrance gel 45.

With reference now to the circuit of figure 12, the function of the air freshener circuit is to provide energy from a 6 volt POLAROID POLAPULSE<sup>(RTM)</sup> battery 19 to four heaters 47, 48, 49 and 50 which are switched on one at a time for approximately 30 seconds at intervals of approximately 4 hours. CMOS integrated circuit technology is used as this will allow the circuit to cope with voltage variation which occurs as a result of the different load conditions and the state of discharge of the battery 19.

15

A photo-switch 51 is optionally fitted and comprises a transistor, a photo-resistor and a control resistor. As the photo-resistor is exposed to light its resistance decreases, raising the base current in the transistor. The transistor will then conduct between collector and emitter terminals, switching the main control circuit on.

20

A timer 52 is a dual 14 pin CMOS timer, which consists of two 7555 timers contained in the same chip. These share only the Vss and Gnd terminals and will hereinafter be referred to as Timer "A" and Timer "B" for clarity. Timer "A" is connected in a stable mode to provide continuous square wave output. The values of external components, capacitor CT1 and resistor RT1, are selected so that one cycle will occur every 55.25 second. This output is processed through the other components to provide a four hour timing function.

25

Timer "B" is connected in monostable mode to provide a short pulse, each time it is triggered. The values of the external components, C12 and R12, are selected to give a pulse of approximately 30 seconds duration.

30

The counter/divider component 53 (4040B) is arranged to count down the input from the Timer "A" by a factor of 256 to give a continuous square wave output with one cycle occurring every 14400 seconds i.e. every four hours.

5

The output from this device is used to provide the binary "0" signal needed to trigger the Timer "B" every four hours. Two further outputs are used in the decoder part of the circuit.

10

The binary to one of four line decoder device 54 (4555B) switches a binary "1" signal from one of the four outputs to the next every four hours, provided that the enable pin is at the binary "0" level. The output from the Timer "B" enables the decoder 54 for 30 seconds synchronised to occur immediately each time one of the four outputs is switched on. The decoder is then dis-enabled for the remainder of the four hour period.

15

An inverter device 54 (4049UB) converts the 30 second binary "1" output signal from Timer "B" to the binary "0" signal required to enable the decoder 54.

20

Output transistors TR1, TR2, TR3 and TR4 are used if the heaters require more current than can be provided by the CMOS timing control components. These transistors are therefore used to switch the heaters on and off. The four 1k resistors are connected between the decoder 54 and each transistor in order to limit the base current.

25

The operation of the circuit will now be considered.

To operate the circuit, power is supplied by the battery 19, optionally via the photo-switch 51, to Timer "A" as the dual timer chip 52, which provides a continuous square wave output.

30

Capacitor Ct1 and resistor Rt1 ensure that the cycle will occur every 56.25 seconds. This output is processed through a counter divider 53 which counts down the

input from the Timer "A" by a factor of 256 to give a square wave output with one cycle occurring every 14400 seconds (four hours).

One output from the counter divider is used to provide the binary "O" signal  
 5 needed to trigger Timer "B" every four hours. A binary "1" signal from each one of the four outputs is switched by the four line decoder to the next output every 4 hours when the activator pin is at binary "O" level.

Timer "B" provides the output to the decoder 54 to activate it for 30 seconds  
 10 which is synchronised to occur immediately each time one of the four inputs is switched on. The decoder is then deactivated for the remainder of the four hour cycle.

The inverter 55 converts the 30 second binary "1" signal from Timer "B" to the  
 15 binary "0" signal which activates the decoder.

Because the heaters marked LOAD 1, LOAD 2, LOAD 3 and LOAD 4 require  
 more current than can be supplied by the CMOS timing control components, the transistors marked TR1, TR2, TR3 and TR4 are used via four 1k resistors, which limit the  
 base current of the transistors, to switch the four heaters on and off.

20 The processing circuit controls the heating of the fragrance which in turn effects the output of the fragrance. The heater heats the fragrance to between 8° to 10°C depending on the amount of fragrance that is in contact with the heating element. This will be a relatively thin deposit such that intimate contact with the heater element warms  
 25 the fragrance through to release as much fragrance as possible.

The cartridge, when in use, is arranged vertically so that the heated fragrance is forced to rise through the air freshener so that convection assists the fragrance to escape through a vent (not shown) at the top of the housing or casing. Alternatively, a small fan  
 30 may be housed in the carrier which, when powered from the cartridge battery is enabled



with a synchronised delay with the heating effect so distributing the fragrance release more quickly

5 The time circuit controls a 4 hour cycle which can last for a period between 42 or 60 days, or dependent on the room size ambient temperature or other parameters. A steady drain is produced on the battery which is expected to last for this length of time.

10 The battery indicator 10 shows the condition of the battery and the life remaining therein. In such a device, heat is used to change the condition of a heat sensitive printed indicator with a grading between "high" and "low". Alternatively, the indicator can show the state of the charge of the battery.

15 The battery 19 may include a simple switch which, on insertion in the air freshener housing, is switched on, activating the timer circuit to release the sequence of fragrances. Once the switch is operated to the "on" position, this is irreversible. Power from the battery is available during the hours of daylight or artificial light, and a simple opto-switch in the form of an electronic chip that senses ambient light may be provided to shut off the operation of the air freshener timer circuit during night hours if desired.

20 While the above described embodiments have described the use of four fragrances, it may well be that the use of three fragrances would be sufficient.

25 It is also envisaged that of the fragrances used, one of the fragrances could be a main fragrance while the other two or three fragrances would be subsidiary fragrances. In this way, the main fragrance could be continuous while the subsidiary fragrances could be combined with the main fragrance at the controlled four hour periods. With this type of arrangement, the main fragrance could be such that it is released into the atmosphere at ambient temperatures, only the subsidiary fragrances being subject to heating. It will be understood that, where a main and subsidiary fragrances are used, the amount of the main  
30 fragrance would be significantly larger than the subsidiary fragrances.

As briefly mentioned earlier, the fragrances may be totally different but may instead be different "tones" of the same fragrance. Thus, for example, if the fragrance was to be apple, the main fragrance could be of an intermediate "tone", such as Golden Delicious, this main fragrance being supported by a sweeter "tone" such as Cox's Orange Pippin and by a more bitter "tone" such as Granny Smith's.

Various sequences of fragrance tones could be provided. For example, with a main fragrance A and two subsidiary fragrances B and C a suitable sequence would be A, A+B, A, A+C, A etc. With three fragrances of equal value, the sequence A, B, C, A etc. could be used.

In a more sophisticated air freshener, a micro processor could be used to give overriding control of the circuitry and this micro-processor could be provided with a user interface so that the user could control the programming of the air freshener. Such control could range from variations of the timing of the sequences to control of which fragrances were actually being used and in what sequence.

It will also be understood that while the above described cartridge could act as a stand alone air freshener, ideally, the cartridge would be used in conjunction with an exterior casing. In this case, the cartridge could contain only the fragrances and the battery (where not mains operated) the remainder of the circuitry being maintained in the casing. The heaters themselves could be provided either in the casing or in the cartridge. The cartridge could merely contain the fragrances while a separate replaceable battery is used.

The fragrance cartridge may contain a plurality of fragrances all in one cartridge which remind the recipient of the four seasons, spring, summer, autumn and winter and within any one season, there will be four elements that will be activated within the repeat cycle. The cartridge is sealed for storage by a peel-off film which exposes the fragrance carrying material. While this material has been described herein as a gel, it will be understood that other materials such as solid, liquid or powder may be used.

In operation, the fragrances would be emitted into the atmosphere continuously and energised every 3 or 4 hours, without repetition for at least one full cycle.

- 5           The timer operates the heating element to activate a selected fragrance once every 3 to 4 hours for a period of between 30 and 40 seconds, which is enough to heat the fragrance gel up to between 8° and 10°C.

- 10           The air freshener has a wide application of uses, for example, free standing on a window sill in a domestic building, in an office, or in a car or other vehicle. The housing may be designed to fit into an attractively designed holder, which could stand unobtrusively on a desk or vanity unit, or adhered to a vertical surface such as a wall or a horizontal surface such as a ceiling.

**CLAIMS**

1. An air freshener for dispensing a plurality of fragrances into the surrounding atmosphere, comprising a casing, a timing circuit including an electronically  
5 programmable chip, a heating device controlled by the chip and a replaceable cartridge having a plurality of fragrance carriers selectively heatable by the heating device under the control of the chip to emit a controlled sequence of energised fragrances into the surrounding atmosphere.
- 10 2. An air freshener as claimed in claim 1, wherein the plurality of fragrances comprise at least two fragrances of a complementary nature.
3. An air freshener as claimed in claim 2, wherein the complementary fragrances are different tones of the same fragrance.
- 15 4. An air freshener as claimed in claim 1, 2 or 3, wherein at least three fragrances are provided, and comprise a main fragrance and two subsidiary fragrances.
5. An air freshener as claimed in claim 4, wherein the main fragrance is permanently  
20 dispensed while the two subsidiary fragrances are eneregised at intervals in sequence.
6. An air freshener as claimed in any preceding claim, wherein the heating elements of the heating device are contained in the replaceable cartridge.
- 25 7. An air freshener as claimed in any preceding claim, wherein power for the air freshener is provided by a battery.
8. An air freshener as claimed in claim 7, wherein the battery is contained in the cartridge.
- 30 9. An air freshener as claimed in any one of claims 1 to 6 wherein power for the air freshener is provided by the mains.

10. An air freshener as claimed in any preceding claim, wherein a visible indicator is provided in the casing for indicating the current life status of the fragrance and/or battery (if provided) and/or the cartridge as a whole.

5

11. An air freshener as claimed in any preceding claim, wherein the timing circuit has an opto-switch which can sense ambient light conditions and which can switch the air freshener on or off in dependence thereon.

10 12. An air freshener as claimed in any preceding claim, wherein a micro-processor is associated with the timing circuit to enable programming of the air freshener by the user.

13. An air freshener as claimed in any preceding claim, wherein the heating device comprises an electric resistance foil located in the fragrance carrier.

15

14. An air freshener as claimed in any one of claims 1 to 12, wherein the heating device comprises resistance wires whether or not on a ceramic base.

15. An air freshener as claimed in any one of claims 1 to 12, wherein the heating  
20 device comprises an etched or printed resistance circuit controlled by a printed circuit board, the resistance circuit passing through individual fragrance carriers.

16. An air freshener substantially as described herein with reference to the drawings.

25



Application No: GB 9822541.0  
Claims searched: 1 to 16

15

Examiner: Graham S. Lynch  
Date of search: 10 July 2000

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): A5G (GV)

Int Cl (Ed.7): A61L 9/03

Other: On-line : WPI, EPODOC, JAPIO

### Documents considered to be relevant:

| Category | Identity of document and relevant passage |                                     | Relevant to claims |
|----------|---|-------------------------------------|--------------------|
| A, E     | GB 2330308 A                              | ARRIVA. Whole document.             |                    |
| A        | GB 2279010 A                              | PU. Whole document.                 |                    |
| A        | EP 0831384                                | RICOH. Whole document.              |                    |
| A, E     | WO 99/16476                               | PEREX AGORRETTA.<br>Whole document. |                    |
| X, E     | WO 99/08174                               | ILLINOIS INST. TECH. Pages 1, 2.    | 1.                 |
| X        | WO 97/39779                               | MICHELIN. Whole document.           | 1, 9.              |
| A        | WO 97/37693                               | DE SOUSA. Whole document.           |                    |
| A        | US 5115975                                | SHILLING. Whole document.           |                    |
| A        | US 4695434                                | SPECTOR. Whole document.            |                    |
| X        | US 4629604                                | SPECTOR. Whole document.            | 1, 9, 14.          |
| A        | US 4603030                                | MCCARTHY. Whole document.           |                    |
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|   |   |   |  |
|---|---|---|--|
| X | Document indicating lack of novelty or inventive step   | A | Document indicating technological background and/or state of the art   |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention.          |
| & | Member of the same patent family  | E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |



The  
Patent  
Office



INVESTOR IN PEOPLE

Application No: GB 9822541.0  
Claims searched: 1 to 16

14

Examiner: Graham S. Lynch  
Date of search: 10 July 2000

| Category | Identity of document and relevant passage | Relevant to claims |
|----------|---|--------------------|
|          |   |                    |

|   |   |   |  |
|---|---|---|--|
| X | Document indicating lack of novelty or inventive step   | A | Document indicating technological background and/or state of the art.  |
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| & | Member of the same patent family  | E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |